



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification<sup>4</sup> :</b> <b>A23B 7/02, 7/148, 7/152</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 86/ 01686</b> <b>(43) International Publication Date:</b> 27 March 1986 (27.03.86)
<b>(21) International Application Number:</b> PCT/AU85/00209 <b>(22) International Filing Date:</b> 30 August 1985 (30.08.85) <b>(31) Priority Application Number:</b> PG 7174 <b>(32) Priority Date:</b> 17 September 1984 (17.09.84) <b>(33) Priority Country:</b> AU  <b>(71)(72) Applicants and Inventors:</b> LEWIS, Victor, Marcus [AU/AU]; LEWIS, David, Adrian [AU/AU]; 19A Boundary Street, Rushcutters Bay, NSW 2011 (AU). <b>(74) Agent:</b> ARTHUR S. CAVE & CO.; Gold Fields House, 1 Alfred Street, Sydney, NSW 2000 (AU).		<b>(81) Designated States:</b> DE, GB, US.  <b>Published</b> <i>With international search report.</i> <i>With amended claims.</i>
<b>(54) Title:</b> INTERMEDIATE MOISTURE VEGETABLES  <b>(57) Abstract</b>  Process for producing a plant product, which term is to be understood as covering all types of products normally regarded as vegetables including leaves, roots, bulbs, stems and immature and mature fructifications, the sweet fleshy fructifications of plants normally referred to as fruits and non edible plant material. The plant product is of intermediate moisture content which is microbiologically stable at water activity levels within the range of 0.5 to 0.85 and is free of additives used to prevent microbial spoilage. The process resides in the steps of dehydrating a plant product to produce the moisture content to 10 to 50% and thereafter holding the product in an oxygen free or substantially oxygen free atmosphere.		

*FOR THE PURPOSES OF INFORMATION ONLY*

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	GA	Gabon	MR	Mauritania
AU	Australia	GB	United Kingdom	MW	Malawi
BB	Barbados	HU	Hungary	NL	Netherlands
BE	Belgium	IT	Italy	NO	Norway
BG	Bulgaria	JP	Japan	RO	Romania
BR	Brazil	KP	Democratic People's Republic of Korea	SD	Sudan
CF	Central African Republic	KR	Republic of Korea	SE	Sweden
CG	Congo	LI	Liechtenstein	SN	Senegal
CH	Switzerland	LK	Sri Lanka	SU	Soviet Union
CM	Cameroon	LU	Luxembourg	TD	Chad
DE	Germany, Federal Republic of	MC	Monaco	TG	Togo
DK	Denmark	MG	Madagascar	US	United States of America
FI	Finland	ML	Mali		
FR	France				

## INTERMEDIATE MOISTURE VEGETABLES

The present invention relates to a process of producing fruits and vegetables of intermediate moisture content, hereinafter referred to as a plant product. The term  
5 vegetables as used herein denotes all types of produce normally regarded as vegetables including leaves, roots, bulbs, stems and immature and mature fructifications thereof. The term also includes non-edible plant material. The term fruits refers to the sweet fleshy fructifications of plants normally referred to  
10 as fruits.

Dehydrated vegetables have long been products of commerce. They may be produced by hot air drying, freeze drying, puff or explosion drying, osmotic drying or other methods. Irrespective of the method used for drying, the  
15 distribution and use in commerce of dehydrated vegetables has been restricted to products which are usually hard and brittle having moisture levels between about 2% and 8% and with water activities usually below 0.5. If moisture levels or water activities rise above these levels, the products are regarded  
20 as unstable with relatively rapid and undesirable deterioration in colour, flavour and aroma. If the water activity rises above 0.6, the products are susceptible to microbial action.

Vegetables at these low moisture contents suffer from the following disadvantages:

- 25 1. They are slow to rehydrate;
2. They usually have, after reconstitution, a disagreeable "dehydrated" or "hay like" flavour;
3. They are excessively brittle, shatter easily, puncture

packaging materials as a result of sharp edges; and

4. Their texture, after rehydration, still remains somewhat flaccid as a result of irreversible changes to cell structures which have occurred at low moisture contents during manufacture.

5 In commercial practice vegetables can be dried in the initial stages of the process to a moisture content of 10 to 15% in a relatively short space of time. The final stages of drying whereby the moisture content is taken down to the mentioned levels of 2% to 8% is slow and costly, and it is  
10 during these last stages of dehydration that most deteriorative changes occur.

The time and quality problems associated with this final drying stage have been overcome to some extent by processes such as dehydrofreezing, where the product is first partially  
15 dried, then frozen, and dehydrosalting where the product is partially dehydrated then stored in salt brine. However, disadvantages are the cost of freezing and of frozen storage on the one hand, and the presence of liquid brine and high concentrations of salt on the other hand.

20 Australian Pat. No. 532,414 (Lewis and Lewis) describes a method whereby salt with or without other solutes is readily introduced into partially dehydrated vegetables, to produce intermediate moisture products of good stability with relatively high water activity levels (0.45 - 0.85) and  
25 relatively high moisture contents (up to 25%). The production of these vegetables involves a two stage dehydration process separated by a short impregnation step.

Experiments conducted by the applicants in relating to the

moisture content of vegetables during dehydration to the water activity, have revealed that as the moisture content of the vegetable is reduced, so the water activity drops from just below 1.0 for the fresh vegetable, to below 0.5 as the vegetable is reduced to 10% moisture or thereabouts. As the vegetables are reduced below this moisture content they become progressively harder and more brittle and rehydration time increases.

It is well known that in order to protect foods from bacterial growth, the food should be at a water activity below 0.85. However, moulds and yeasts have been observed to grow in an environment as low as 0.6 (see JA Troller, Food Technology 1979 Jan. 72-75; Troller JA and Christian JHB "Water Activity of Foods" Academic Press 1981). It has therefore been usual practice to add to foods in the water activity range of 0.60 - 0.85 artificial preservatives such as sorbic acid and sorbates or sulphites etc. to inhibit growth of yeasts and moulds. Food legislation in many countries recognises the possible danger of commercial distribution of processed foods above a water activity of 0.85 by requiring such foods to be held and distributed under refrigeration.

The applicants have discovered that in the range of water activities between 0.5 and 0.85, the partially dehydrated vegetables in general have excellent colour and are for the most part still pliable, rehydrate very rapidly and when rehydrated have excellent flavour, texture and aroma.

While most vegetables partially dehydrated to water activities of 0.5 to 0.85 will slowly deteriorate in flavour

and colour, and may be subject to microbiological spoilage if not treated with preservatives, applicants have found, surprisingly, that fruits and vegetables in this water activity range which have been studied, if packed in an oxygen free atmosphere keep in excellent condition for substantial periods, in some cases over two years at ambient temperature.

Commercially dried fruits which are commonly available tend to be tough and leathery in texture, dark and unattractive in colour, and have a typical carramelized flavour, which lacks the fresh-fruit aroma. The high level of sulphur dioxide, usually between 2,000 and 3,000 ppm, normally found in dried fruits is often distasteful.

The applicants have found that a wide variety of fruit products including apples, peaches, pears, plums, bananas, papayas and pineapples, can be prepared with excellent flavour and aroma by treating the fruit products in the manner herein set forth for vegetables.

however in certain cases it is desirable to treat prepared fruit pieces with sodium sulphite solution, and dry to water activities between 0.70 and 0.85 and a sulphur dioxide content of between 200 and 1,000 ppm, to provide moisture contents in the range of between 20% to 45%. Such fruits when packaged in an oxygen free atmosphere maintain their colour and aroma to a remarkable degree, and have a tenderness and acceptability quite different from conventional dried fruits. The addition of sulphur dioxide is used to maintain the colour of the fruit and is used at much lower levels than normally used in dried fruits.

Plant products can be prepared at higher water activities than 0.85, packed in an oxygen free atmosphere, and held refrigerated for substantial lengths of time without spoilage and with excellent retention of quality. While such products require refrigeration for storage, they have the advantage of providing a long shelf-life product which is light in weight for transport, is not bulky, does not bruise or break, is of high quality and reconstitutes rapidly.

The invention according to one aspect provides a process for producing a plant product of intermediate moisture content which is microbiologically stable at water activities within the range of 0.5 to 0.85 and is free from agents used to prevent microbial spoilage (preservatives) which comprises the steps of partially dehydrating fruit or vegetables until the moisture content is reduced to 10% to 45% and there after holding the resultant product in an oxygen free or substantially oxygen free atmosphere. Preferably the product is packed in a container of low oxygen permeability, all or substantially all of the free oxygen gas is removed therefrom and optionally replaced with an oxygen-free inert gas or alternatively said product is stored under vacuum.

The so called gas packaging of foods is not in itself novel. For the most part, however, the use of inert gas or vacuum has been used to prevent the development of rancidity in such products as milk powder, coffee, nuts, etc. Gas packaging has also been used for conventional fully dried vegetables such as carrots in an attempt to lessen the "hay like" odour that develops in some of these products. Gas packaging has also

been used with fresh fruits and vegetables to prolong the shelf-life under refrigeration, but the use in these circumstances is for the main purpose of controlling respiration of the plant tissue.

5           Work is reported in the literature (Advances in Food Research, Vol I, pp 342 - 346, 1948, Academic Press, N.Y. USA) on the effect of oxygen on the deterioration of dried fruit. These studies, however, refer to the darkening of such fruits at conventional moisture levels. The effect of oxygen on the  
10           microbiological stability and the quality of fruits at higher than normal moisture contents is not reported or contemplated. The oxygen free packaging enables the manufacture of intermediate moisture products with moisture contents of 10 - 45%, and with water activity levels between 0.5 to 0.85, with  
15           good shelf-life at ambient temperatures and excellent retention of colour and quality. By additionally using refrigerated storage, useful shelf-life can be obtained for a plant product held in oxygen free or substantially oxygen free atmosphere at water activity levels above 0.85.

20           In one form of the invention the oxygen gas is evacuated from a package of the plant product with the aid of pumps and in another form of the invention the oxygen gas is removed from the package with the aid of oxygen absorbers placed within the package.

25           The invention according to another aspect comprises a plant product of intermediate moisture content which is bacteriologically stable at water activities within the range of 0.5 to 0.85 and which is free from artificial preservatives

said plant product being held in an atmosphere which is oxygen free or substantially oxygen free.

The more completely the oxygen is removed, in most cases, the better the keeping quality of the product.

5 For storage, the product should be packed in oxygen impermeable containers such as cans or glass jars, or in flexible packaging materials with low oxygen permeability such as aluminium foil laminates or clear laminates made with polyvinylidene chloride or similar materials.

10 In packaging, the oxygen should be removed from the container and replaced with an oxygen free inert gas such as nitrogen or a mixture of such gases, and/or oxygen absorbers such as finely powdered iron in suitably prepared pouches should be included in the packages.

15 High speed equipment for inert gas packaging is commonly available as is equipment for vacuum packaging. Likewise, the operation of inserting oxygen absorbing pouches can be mechanised. Other oxygen absorbing systems are described in the technical literature (Lewis, Rambottom and Craine US Patent  
20 No. 3,419,400; Buckner, N. German Patent No. 81.48,240) and these may be used depending on their cost and efficiency.

25 With many vegetables, such as carrots, red peppers and sweet potatoes, prepared in this water activity range, no additives are necessary and excellent colour retention is obtained. With other vegetables, such as potatoes and onions and with fruits, it may be necessary to add modest quantities of sulphite or sulfur dioxide before packaging to minimise discoloration during storage. However the sulfur dioxide is to

prevent discolouration, and need not be used in quantities commonly used to inhibit the growth of yeasts and moulds.

According to one form of the invention the fruits or vegetables are trimmed and cut as required to be suitable for dehydration. They are then dehydrated in any conventional manner, with or without prior blanching in steam, water or by other means, to a stage where the water activity lies between 0.5 and 0.85 for vegetables or 0.70 - 0.85 for fruits. They may optionally be treated before, during or after dehydration with sufficient levels of sulfur dioxide or sulfites and/or other additives to inhibit discolouration during storage. Either before, during or after dehydration the fruit or vegetables may be flavoured or seasoned or treated with vitamins, minerals, colouring substances etc. as may be required. Finally, they are packaged and maintained in an atmosphere which is free or substantially free from oxygen. An oxygen free atmosphere can additionally or alternately be maintained in the package by the absorption of oxygen within the package by the use of oxygen absorbers of different types such as iron powders, glucose-glucose oxidase systems etc.

The invention will now be described in further detail with reference to the following non limiting examples.

Example I - Sweet Potatoes

Orange fleshed sweet potatoes were peeled, and cut into slices 3mm thick. These were blanched in steam of 2 mins, then washed with a water spray and placed on trays in a dehydrator.

The sweet potatoes were dried to moisture contents of 18.3%, 14.8% and 10.7% at which moisture contents the water

activities were 0.82, 0.77 and 0.61 respectively.

All samples were packaged in laminated bags of aluminium foil and polythene, and were sealed in an atmosphere of nitrogen (after evacuation). Samples at each moisture content were stored at 40°C and at ambient temperature (about 22°C). The samples at 40°C were still in excellent condition in regard to flavour and colour, after four months storage. At ambient temperature, the sweet potatoes were in excellent condition after thirteen months storage. Based on the storage stability at 40°C, it was estimated that the product would have a shelf-life of about two years at ambient temperatures.

#### Example II - Potatoes

Potatoes were peeled and cut into strips 3mm x 3mm. These strips were blanched in boiling water for three minutes, washed to remove surface starch, and placed in the dehydrator. When the moisture content was about 40%, the potato shreds were removed from the dehydrator and tumbled with a solution of sodium sulphite, such that the final sulphur dioxide content of the dried potatoes was about 250 ppm. The potatoes were returned to the dehydrator and were dried to a moisture content of 15.6%. The water activity of the potatoes at this moisture content was 0.85. The shreds were a good pale colour, and were not brittle. They were packed in nitrogen in foil pouches and stored at ambient temperatures.

Samples were opened monthly. After five months the products were excellent but after six months, the shreds had developed a slight off-colour, but had good aroma and flavour.

Example III - Carrots

Carrots were peeled and shredded into strips of 3mm x 3mm section. These were blanched in steam for four minutes and dried in a through-bed dryer at 70°C. Samples were removed at moisture contents of 29.7%, 13.6% and 10.0%. The water activities of these samples were 0.82, 0.65 and 0.50 respectively.

When added to boiling water, the samples cooked in 3 to 5 minutes, and all were of excellent flavour and texture when cooked.

The samples were packaged in clear, laminated film made from layers of polyvinylidene chloride, nylon and polyethylene, and sealed after the addition of a small sachet of oxygen absorber. ("Ageless", manufactured by Mitsubishi Gas and Chemical Co., Tokyo, Japan.)

After thirteen months storage at ambient temperature, all three samples had retained excellent aroma, flavour and colour.

Example IV - Red Peppers

Red bell peppers were cored and cut into dice of approximately 7mm. They were dried at 70° in a forced air through bed dehydrator to a moisture content of 20%. At this moisture content they had a water activity of 0.67. The pepper dice had a bright red colour, had a pliable texture, and when cooked resembled fresh cooked peppers in colour, texture and flavour. The dried dice were packaged in low oxygen transmission laminated film together with oxygen absorber pouches.

The peppers retained their bright colour for about 8 weeks

when stored at 40°C, and were still excellent in colour and flavour after thirteen months storage at ambient temperatures.

#### Example V - Peaches

Peaches of the Golden Queen variety were peeled and pitted  
5 and cut into wedges, approximately 1cm in depth at the thickest point. They were dipped for 5 mins in 1% sodium sulphite solution and dried at 70 - 80°C in a through bed dehydrator until the moisture content was 23.4%. The water activity of the peaches at this moisture content was 0.83. The  
10 sulphur dioxide content was 640 ppm.

The dried peach pieces were packed in low oxygen transmission film with oxygen absorbers. After 2 months storage at 40°C, they showed no signs of spoilage, and were still a bright golden orange in colour. Fruit kept at ambient  
15 temperature had excellent texture, flavour, aroma and colour after 8 months.

#### Example VI - Apples

Apples of the Jonathon variety were peeled, cored and cut into wedges each one twelfth of the fruit. The wedges were  
20 dipped for 5 mins in a 0.1% sodium sulphite solution, drained and dehydrated at 70°C until they were reduced to a moisture content of 42.7% and a water activity of 0.93. The sulphur dioxide content was 485 ppm.

The apple pieces were packed in low oxygen transmission  
25 film together with an oxygen absorber and stored refrigerated at below 5°C.

After seven months storage, the apples showed no signs of deterioration, and had excellent colour, flavour and aroma.

Example VII - Apples

Apples of the Granny Smith variety were peeled, cored and cut into slices 3mm in thickness. After slicing, the apples were dipped in a 1% solution of sodium sulphite for one minute, and then drained. The apple slices were dried in a through bed dehydrator at 70°C. The sliced apples were dried to a moisture content of 37.7%, at which they had a water activity of 0.79. The sulphur dioxide content was 410 ppm.

The slices were packed in nitrogen in foil pouches and kept at ambient temperature. After ten months, the fruit was still white in colour and had a fresh aroma and flavour.

Example VIII - Pears

Pears of the Packham variety were peeled, cored and cut into wedges, each representing about one eighth of the whole fruit. The fruit pieces were dipped for 1 min in a 1% solution of sodium sulphite, were drained, and dried in a through bed dehydrator at 70°C to a moisture content of 43.4% and a water activity of 0.82. The final sulphur dioxide content was 960 ppm.

The pears had a pale colour and a fresh flavour and aroma.

The pear segments were packaged in low oxygen transmission film with proprietary oxygen absorbers. The dried fruit showed no apparent spoilage or deterioration in colour or flavour after 10 months storage at ambient temperatures.

In some cases eg. grapes, the use of sulphur dioxide is not necessary.

Example IX - Grapes

Grapes of the Thompson Seedless variety were dipped in

2.5% potassium carbonate solution to render the skin more permeable, and dried at 70°C to a water activity of 0.85.

The moisture content was 35.5%. The grapes were packed in nitrogen in a foil laminate pouch. After four months storage at room temperature, the grapes were in excellent condition.

1. A process for producing a plant product of intermediate moisture content which is microbiologically stable at water activity levels within the range of 0.5 to 0.85 and is free from additives used to prevent microbial spoilage which comprises the steps of dehydrating a vegetable or fruit to reduce the moisture content thereof to 10% to 50% and thereafter holding the resultant plant product in an oxygen free or substantially oxygen free atmosphere.
2. A process as claimed in claim 1 in which the fruit or vegetable is treated either before, during or after dehydration with one or more additives selected from the group consisting of discolouration inhibiting agents, flavouring agents, seasoning agents, minerals, vitamins and colouring agents.
3. A process as claimed in claim 1 wherein said plant product is packed in a container and the oxygen in the container is removed with the aid of pumps.
4. A process as claimed in claim 1 wherein the oxygen in said container is removed by oxygen absorbers placed within the container.
5. A process as claimed in claim 3 or 4 wherein said oxygen is replaced with an inert gas.
6. A process as claimed in claim 5 wherein said inert gas is nitrogen.
7. A process as claimed in claim 1 wherein said plant product is blanched prior to said dehydration step.
8. A process of producing a fruit product of intermediate moisture content which is microbiologically stable at water

activity levels of 0.70 to 0.85 and which is free from additives used to prevent microbial spoilage which comprises the steps of treating said fruit with a sulphite solution to give said fruit a sulphur dioxide content of between 200 to 1,000 ppm, dehydrating said fruit to reduce the moisture content thereof to 10 to 45% and thereafter holding the resultant food product in an oxygen free or substantially oxygen free atmosphere.

9. A process as claimed in claim 8 in which the fruit is treated either before, during or after dehydration with a member selected from the group consisting of discolouration inhibiting agents, flavouring agents, seasoning agents, minerals, vitamins and colouring agents.

10. A process as claimed in claim 8 wherein said fruit is packed in a container and the oxygen in the container is removed with the aid of pumps.

11. A process as claimed in claim 8 wherein the oxygen in said container is removed by oxygen absorbers placed within the container.

12. A process as claimed in claim 8 wherein said oxygen is replaced with an inert gas.

13. A process as claimed in claim 8 wherein said inert gas is nitrogen.

14. A plant product which is microbiologically stable at water activity levels of 0.50 to 0.85 and which is free from agents used to prevent microbiological spoilage, said plant product having its moisture content reduced to 10 to 45% and being stored in an oxygen free or substantially oxygen free

- 16 -

atmosphere.

15. A plant product produced by the process as claimed in any one of claims 1 to 13 hereof.

16. A plant product substantially as hereinbefore described with reference to the accompanying examples.

## AMENDED CLAIMS

[received by the International Bureau on 19 February 1986 (19.02.86);  
original claim 8 amended; other claims unchanged (1 page)]

activity levels of 0.70 to 0.95 and which is free from additives used to prevent microbial spoilage which comprises the steps of treating said fruit with a sulphite solution to give said fruit a sulphur dioxide content of between 100 to 1,000 ppm, dehydrating said fruit to reduce the moisture content thereof to 20 to 60% and thereafter holding the resultant food product in an oxygen free or substantially oxygen free atmosphere.

9. A process as claimed in claim 8 in which the fruit is treated either before, during or after dehydration with a member selected from the group consisting of discolouration inhibiting agents, flavouring agents, seasoning agents, minerals, vitamins and colouring agents.

10. A process as claimed in claim 8 wherein said fruit is packed in a container and the oxygen in the container is removed with the aid of pumps.

11. A process as claimed in claim 8 wherein the oxygen in said container is removed by oxygen absorbers placed within the container.

12. A process as claimed in claim 8 wherein said oxygen is replaced with an inert gas.

13. A process as claimed in claim 8 wherein said inert gas is nitrogen.

14. A plant product which is microbiologically stable at water activity levels of 0.50 to 0.85 and which is free from agents used to prevent microbiological spoilage, said plant product having its moisture content reduced to 10 to 45% and being stored in an oxygen free or substantially oxygen free

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/AU 85/00209

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) <sup>6</sup> According to International Patent Classification (IPC) or to both National Classification and IPC Int. Cl. <sup>4</sup> A23B 7/02, 7/148, 7/152		
<b>II. FIELDS SEARCHED</b>		
Minimum Documentation Searched <sup>7</sup>		
Classification System	Classification Symbols	
IPC	A23B 7/02, 7/14, 7/148, 7/152	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are included in the Fields Searched <sup>8</sup>		
AU : IPC as above; Australian Classification 34.7641		
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT<sup>9</sup></b>		
Category <sup>9</sup>	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>
X,Y	US,A, 4384009 (LEWIS) 17 May 1983 (17.05.83)	(1-16)
Y	US,A, 3769042 (KAPLOW) 30 October 1973 (30.10.73) See column 6 lines 55-58, column 7 lines 61-64	(1-16)
Y	US,A, 3634102 (PAYNTER) 11 January 1972 (11.01.72)	(1-16)
Y	US,A, 3634104 (KAPLOW) 11 January 1972 (11.01.72) See the abstract, column 5 lines 4-20, the examples	(1-16)
P	US,A, 4496597 (REGES) 29 January 1985 (29.01.85)	(1-16)
A	US,A, 4447460 (LEWIS) 8 May 1984 (08.05.84)	(1-16)
A	US,A, 1380489 (McLAUGHLIN) 7 June 1921 (07.06.21) See page 1 lines 80-81, claim 1	1
A	US,A, 3895122 (SHATILA) 15 July 1975 (15.07.75)	1
X	AU,B, 50905/79 (523911) (LEWIS) 17 April 1980 (17.04.80) See the examples	(1-16)
A	AU,A, 11644/83 (SOCIETE DES PRODUITS NESTLE S.A.) 8 September 1983 (08.09.83)	1
X	DE,A, 1492712 (UNILEVER N.V.) 4 June 1969 (04.06.69)	(1-16)
X	DE,B, 1163125 (THE PILLSBURY COMPANY) 13 February 1964 (13.02.64)	(1-16)
(CONTINUED)		
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p><sup>9</sup> Special categories of cited documents: <sup>10</sup></p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&amp;" document member of the same patent family</p> </div> </div>		
<b>IV. CERTIFICATION</b>		
Date of the Actual Completion of the International Search 03 December 1985 (03.12.85)	Date of Mailing of this International Search Report 09 DECEMBER 1985 (09.12.85) <span style="float: right;">△</span>	
International Searching Authority Australian Patent Office	Signature of Authorizing Officer <div style="text-align: center;">           (R.E. GRANT)       </div>	

△  
1547A

## III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
------------	--	----------------------

X	DE,C, 572308 (PETITPAS) 14 March 1933 (14.03.33)	(1-16)
A	JP,A, 57/33539 (MITSUBISHI GAS KAGAKU K.K.) 23 February 1982 (23.02.82) (JAPATIC English Language Abstract)	1
A	CH,A, 529512 (LARROCHE) 15 December 1972 (15.12.72)	1

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON  
INTERNATIONAL APPLICATION NO. PCT/AU 85/00209

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Members			
US 4384009	AU 50905/79	BE 879175	CA 1129712		
	DE 2939407	ES 484649	FR 2437791		
	GB 2031711	JP 55071441	MX 6272		
	NL 7907281	NZ 191640	SE 7907760		
US 3769042	BE 724212	CA 918489	DE 1810035		
	ES 360477	FR 1602209	GB 1251357		
	GB 1251358	US 3634104	US 3745027		
	US 3595681				
US 3634104	BE 7242121	CA 918489	DE 1810035		
	ES 360477	FR 1602209	GB 1251357		
	GB 1251358	US 3769042	US 3745027		
	US 3595681				
US 4447460	BE 884194	CA 1166893	DE 3025594		
	ES 493241	FR 2460626	GB 2053656		
	IL 60380	JP 56048848	MX 6168		
	NL 8004020	NZ 194299			
US 3895122	BE 785681	CA 1004536	FR 2144699		
	GB 1384444	NL 7209142	US 3959501		
	US 3975551				
AU 11644/83	AU 11609/83	BR 8301055	EP 87667		
	EP 88255	ES 519387	FR 2522478		
	JP 58179473				

CONTINUED

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON  
INTERNATIONAL APPLICATION NO. PCT/AU 85/00209  
(CONTINUED)

---

Patent Document  
Cited in Search  
Report

Patent Family Members

---

DE 1492712

IT 1004501

NL 6502952

---

CH 529512

BE 77028

DE 2136441

FR 2098889

GB 1349761

IT 972078

LU 63582

NL 7110418

RO 62191

US 3800049

FR 2137111

---

END OF ANNEX

